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A Fight for Five Thousand Freedoms

Progress means going forward. It must build more than is destroyed or it does not merit its name. Not only should it be of a tangible, material character, but it should contain the elements of greater spiritual growth for the individual and community alike. It should lift the chin and put a new spring into humanity's step.

The President of the United States has said that we are fighting for four freedoms—freedom from want and freedom from fear, freedom of speech and freedom of religion. A former President of the United States, Herbert Hoover, has added that a fifth freedom is also mandatory in the victory—freedom of economic enterprise.

The scientist accepts these freedoms unreservedly. To their attainment he is glad to give life itself, if that is the price. But the scientist is fighting just as whole-souledly for five hundred, yes, for five thousand other freedoms.

The freedom to work, to expand the intellect, to worry through with a theory until it is validated or disproved; the freedom to banish the wasteful and enthrone the efficient; the freedom to improve, if he can, everything that exists under the sun, and beyond that to create things upon which the sun has never before shone—these, too, are freedoms for which the true scientist fights.

As a man, he fights for the freedom to better his lot and for the rewards that ability merits. As an incurable altruist—and the true scientist is one—he fights even harder for the freedom to better the lot of mankind, that each generation may rise to heights loftier than any won by its predecessor.

A soldier of peace, he fights for the freedom to mold a better destiny, both for the individual and for the race.

These freedoms have always been America's. We fight to keep them America's. Let our swords be mighty, and mighty indeed will be our plowshares.

—From an address before the American Chemical Society on September 7 by Dr. Charles M. A. Stine, vice-president of E. I. du Pont de Nemours and Company, Inc. Reprinted with permission from the *A. A. A. S. Bulletin*, vol. 1, no. 9, November, 1942.

The Great Ice Age in Illinois *

JOHN R. BALL

Illinois is called the Prairie State and is said to be the most level State in the Union with the exception of Delaware and Louisiana. Prairie lands always have been more or less mystifying, both on account of their treelessness and on account of their remarkable fertility. Early settlers, seeking a place to cultivate the soil, had to be convinced that lands not covered with forests still could yield crops. But, these vast, level tracts have convinced the most skeptical that their capacity for corn, wheat, hay and oats is the very highest for lands located physically and climatically as they are.

Illinois is situated in the great corn belt of North America, an area unique in its definite physical and climatic boundaries. The northern boundary of the corn belt is a temperature restriction, the average summer isotherm of 70° F.; the eastern is a soil limit, where the limestones of the belt are replaced by the sandstones and the shales of the Appalachian Plateaus; the south boundary coincides almost absolutely with the soil limits set by Wisconsin glaciation; and on the west, a rainfall limit of anything less than 20 inches, annually, cuts off the profitable growing of corn in that direction.

Science, in general, has had little trouble in establishing the above boundaries. But when the full answer is desired for the treelessness of the prairies, further problems seem to enter in. Probably, in an adequate answer, the climatic factor will appear in as full weight as many ecologists and agriculturists now keep it. Probably, in days long past, vast herds of buffalo once ate the seedling trees; and then, or later, North American Indians may have burned the grass and trees for better grass to come. Nevertheless, just as the tall grass of the prairies gives place, westward, to the short grass of the plains, so the favorable amounts of rainfall and adequate growing season, temperature and soil undoubtedly exert unseen but potent influence for the presence or absence of trees on the prairies.

SYMBOLS OF GLACIATION

Only small areas in Illinois escaped the impress of ice during the successive glacial invasions of the Great Ice Age. The rest of the surface of the state carries evidence that the ice sheets came in successive visits. For at least four times, it advanced and dumped great loads of

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Because of special interest in the glacial history of Illinois on the part of some of the members of the Academy, Dr. Ball was requested to prepare this article, an elaboration of his lecture of the same title given at the Academy, November 22, 1942. --Ed.

transported debris, the "drift sheets." The rock dust, carried in the ice sheets, or borne in by wind and water helped to contribute to the richness of the prairie soils. In the intervals of thousands of years between the ice invasions, animals of different types than the present roamed over the land—land resembling very probably the "oak groves" of northern Illinois today. Lakes appeared between the numerous hills and ridges. Streams drained towards the south as they do now, but the larger, the Missouri, the Mississippi and the Rock Rivers, were blocked and shifted in their courses by the recurrent ice fronts. Probably during no other sequence of geological events throughout the long history of the earth were shifting changes effected more rapidly than during the Great Ice Age.

Accounting in part, then, for the fertility of the prairies, and accounting also for the history of the last million of years before the coming of the white men, appear the evidences for continental glaciation. The list includes:

1. *Glacial drift*: the aggregate of deposits, directly from the ice, and, more indirectly, from the water supplied by the melting ice.
2. *Till*: the clay, in which boulders are embedded, lying wherever released by the melting ice.
3. *Stratified drift*: coarse material, gravel and sand, rudely assorted and stratified, washed from or through the ice by running water.
4. *End moraine*: a hilly belt of drift, released at the margin of the ice sheet and accumulating there because melting at the edge of the ice was balanced by the slow forward movement of the ice bringing more debris to be released.
5. *Ground moraine*: an extensive deposit, mostly till, spread over the general area once occupied by the ice.
6. *Knob and kettle topography*: associated hills and depressions typical of the end moraines.
7. *Kame*: a hill of sand and gravel, in places one of the hills of the end moraine, in other places an isolated hill.
8. *Eskers*: more or less serpentine ridges marking the channels of streams which formerly coursed under the ice, or possibly over its surface.
9. *Drumlins*: relatively short, elongate hills of till, covering the ground moraine and more or less at right angles to the terminal moraine (end moraine).
10. *Erratics*: conspicuous boulders in and on the drift, usually different in composition from that of the bedrock on which the drift rests.
11. *Outwash plain*: an expanse of stratified material, washed out beyond the end moraine, with kettle-like depressions interrupting its flattened surface in certain instances.
12. *Loess*: a fine, porous, silty material relatively free from all pebbles, occasionally quite sandy, originally transported by wind over the drift, or into a region not occupied by the drift.

13. *Transported soils*: when the zone of partly decayed organic matter, sustaining life, is formed on material not directly related to nor derived from the bedrock, it is said to be a transported soil.
14. *Gumbotil*: the compact, impervious, clay-like material, very tenaceous and sticky when wet, produced by the slow decay and alteration of chemical attack during the long time that the land is free from ice.
15. *Numerous lakes, poor drainage*: water stands in the kettles of end moraines, and in the depressions of the ground moraine. Where lakes remain, it is due in part to inadequate stream work, the streams not developed to that point where they either drain the lakes or fill them.
16. *Abnormal streams*: where streams show features not in accord with the normal development, the accidents which may have happened possibly are the results of glaciation.
17. *The Great Lakes*: these are related to the earlier erosional and depositional work of the ice sheets.
18. *Glacial striae*: parallel and sub-parallel scratches and lines made by the rock material held in the ice as the ice moved over the bedrock. Similar scratches are made on the rocks once held in the ice and used as "scrapers." Furrow-like indentations are *grooves*.
19. *Wind-facetted rocks*: strong winds moving out from the dense, cold air over the glaciers used sand and silt as an abrasive to scour pyramidal faces on some of the rocks within reach.
20. *Buried soil zones*: the soil developed at a time when the land was ice-free subsequently was buried beneath till when a new advance of ice developed. With soil zones may be included *peat bogs, marshes* and the alluvial covering of *river flood plains*.

INTERPRETATION OF THE EVIDENCE

All of the evidence above listed by no means escaped the attention of early students of earth phenomena. It was recognized that some agent capable of mass transportation had been at work. And, it was then thought that the striae and grooves probably had been made by the same agent. But the instrumentality of tremendous floods and the work of numerous icebergs were regarded as the more probable causes. It was out of these assumptions that the original use of the term, "drift," came forth; that is, it was thought that the unconsolidated material drifted to its present position.

The correct interpretation of the drift and associated features issued a little more than a hundred years ago. Louis Agassiz, a Swiss-American scientist, poured conviction into the scientific mind of the Old and New Worlds. He is quoted to have said, in so many words, that if he had under him in Switzerland the drift which he observed in England and in America, he would say that an ice sheet had been present.

Like many revolutionary scientific concepts, the glacial theory at first met with unbelief and rejection. It is difficult to imagine in this day of almost universal acceptances that an interpretation, now seemingly so obvious, would ever have caused controversy. It required about twenty-five years for opposition to dwindle to insignificance. In fact, nearly forty years after first mention of the theory a statement was published which will, in quotation, indicate something of the nature of the opposition. "The glacial epoch is a theoretical blunder, not supported by scientific facts or intelligent reasoning, and contrary to all geographical, geological and paleontological information. There is no such geological period, and no gap into which it can possibly be injected."¹

THE PROGRESS OF INTERPRETATION

1. *Extent of Former Glaciation.*—It was found that by mapping the moraines and other glacial traces that the area covered by the vanished ice sheet could be depicted. This, of course, would be an enterprise which would build up with the addition of details. It would grow, also, as extended occupancy of the land makes possible new cross sections of the glacial terranes.

2. *Multiple Glaciation.*—This important step was once set forth under the guise of "Changes of climate during the Glacial Epoch" by James Geikie, a Scottish geologist. Even to those who possessed correct ideas, continental glaciation was but a single episode. It represented an extremely long duration of climatic refrigeration and of ice-locked lands, but it was only that. But Geikie found enough variety and contrast in the several buried faunas to merit the conclusion that decided climatic changes ensued during the intervals of non-glaciation. In less than ten years, his discovery was followed by similar ones in eastern North America. These discoveries made possible the interpretation of the drift sheets as other sedimentary deposits are interpreted, and stratigraphic and structural relationships in the drift were established. Several drift sheets, registering as many distinct advances of the ice were differentiated and named.

3. *Glacial Chronology.*—Up to a certain point, the separation of the several drifts established at once a glacial chronology. A drift sheet on which another drift is deposited becomes known at once as the older of the two drifts. This is but a relative determination of age. The plane separating the two drifts also has a time value. It represents a long time of no glaciation during which the climate passed through possible changes. Here, time in its slow unfolding has written out its own suggestion for the evaluation of the plane separating the two drifts.

¹Miller, S. A., North American Geology and Paleontology, Cincinnati, 1889, p. 90.

Gumbotil, a peculiar alteration of the drift arising from prolonged chemical change, was itemized on a preceding page. The origin of gumbotil² and the existence of definite zones of weathering³ in the upper part of the till, both have been made instrumental in age determinations.

The zonal effects of the chemical weathering of the till downward from the soil and gumbotil constitutes what is known as the soil profile. Gumbotil, itself, is one of the products of weathering, and, under poor surface conditions of drainage, forms one of the zones in the soil profile. The soil profile indicates in rather definite zones the extent of chemical alteration in the till. The development of the soil profile involves a time element, so that, with modifying conditions properly balanced, the existence of a pronounced soil profile indicates the passage of long time. The older drifts may thus present a more conspicuous soil profile than the till but recently uncovered by the ice. Of outstanding significance is the zone in which the downward extent of thorough solution work affecting the mineral composition of the till is apparent. By comparisons involving this factor, the "depth of leaching," and by other means somewhat more technical, estimates of the duration of the several stages of glacial advance and withdrawal have been made. As conventionally used by many geologists, the classification of the Great Ice Age and estimates of time duration are set forth in the accompanying table.

THE PLEISTOCENE TIME SCALE

<i>Glacial Stages</i>	<i>Substages</i>	<i>Estimated Number of Years Ago</i>	<i>Estimated Duration in Years</i>
Recent (Post-Glacial)		25,000	25,000
WISCONSIN - - -	{ Mankato (Late)		
	{ Cary (Middle)		
	{ Tazewell (Early)		
	{ Iowan-Peorian	80,000	
Sangamon Interglacial		150,000	120,000
ILLINOIAN		250,000	
Yarmouth Interglacial		350,000	300,000
KANSAN		650,000	
Aftonian Interglacial		750,000	200,000
NEBRASKAN		950,000	
Beginning of Glaciation		1,000,000	

²Kay, G. F., and Pearce, J. N., The origin of gumbotil. Jour. Geol., vol. 28, 1920, p. 89-125.

³Leighton, M. M. and MacClintock, Paul, Weathered zones of the drifts of Illinois. Jour. Geol. vol. 38, 1930, p. 28-53.

THE GREAT ICE AGE

Geological science has but fragmentary knowledge concerning events in the Mississippi Valley during the few millions of years just preceding the Ice Age. Elsewhere in North America, earth events during that same interim have become very well known. Slowly rising mountains with occasional volcanic peaks became outlined in the far West. Inland from the West Coast, plateau lands and the Rocky Mountains had a time of uplift. Mountain glaciers took form amidst all of the peaks from British Columbia to Arizona and New Mexico.

The Mississippi Valley was hemmed in on the east, also, by highlands but these were not of towering relief. Long seasons of erosion resulting in the planation of the eastern ranges, but occasional uplifts interrupted the cycle. In general, local glaciation did not develop south of the New England mountains.

The low-lying Southern Coastal Plains and the 800-mile stretch of the Mississippi River alluvial plain and delta combined to sketch in that region much as it appears today. Of course the Great Lakes did not exist and several rivers coursed through the valleys now filled in part with glacial and lake sediments. The present Ohio River did not exist, and, far to the northwest, the Missouri River held its course towards Hudson Bay. More than any other single stream, possibly, the Mississippi River met with vicissitudes during glacial times, but before the ice, its course evidently was through the valley of the present Illinois River from its abrupt turn to the south near Hennepin.

Evidently there was sunshine, food and forest in sufficient amount because life did not forsake the land. Citizens of Chicago are more troubled, today, by a few wintry gusts from Lake Michigan than they are by any consideration of "Greenland's icy mountains." Apparently the great assemblage of forest and plain life did not flee blindly and far from intimations of glacial climate. On the contrary there was at the outset of the Ice Age a rich flora and fauna in the Mississippi Valley. Much of the fauna was immigrant: ground-sloths and glyptodons from South America; elephants, bison, mastodons, dogs and cats of existing genera from Asia and of other origins; all these mixed with the horses, camels, deer, antelopes and some sinister carnivores, bears and saber-tooth tigers, some of which originated in North America. Only after long ages of the new conditions did these forms of life change appreciably; some in the sense of wonderful adaptation, like the woolly mammoth, others to pass completely into extinction.

THE NEBRASKAN STAGE

The glacial and interglacial deposits take their names, commonly, from the regions where notable development of particular glacial features occur. The same name is extended to apply to the particular

ice sheet, the deposits it left, and to the time it occupied in its advance. However extensively it may lie under younger drift-sheets, Nebraskan glaciation takes its name from its surface developments in that state.

In 1929, it was disclosed by Wanless,⁴ and a little later by Bell and Leighton,⁵ that a deeply weathered till was exposed sparingly in both Fulton and Scott Counties. Both of the exposures are in deeply cut ravines and a maximum of four feet is all that shows in the Scott County occurrence. It has been penetrated more deeply by the soil auger, however. Lack of effervescence under hydrochloric acid shows that all finely pulverized limestone (containing calcium carbonate) has been taken out in solution. A strong brownish tint indicates a good deal of oxidation and even the pebbles normally to be expected in the drift have disappeared by the work of solvents. Till in the extreme southern part of the state, and also along its eastern border have been regarded as Nebraskan, but later consideration of the evidence seems to make it more probable that the till is younger than that age of glaciation.

THE AFTONIAN INTERGLACIAL STAGE

Interglacial deposits may include assorted and stratified materials washed out and transported relatively short distances by the melt water from the ice. If the melting ice retreated far towards its source, very extensive melt water deposits could be left in its former area. During an interglacial stage, winds have opportunity to blow, loess may be deposited. Standing water may be responsible for peat bogs, and soils, along with gumbotil, may form. Extensive weathering may take place, especially the deep leaching of the drift. Animals may be entrapped in peat bogs or their remains may be covered by loess or the deposits from streams. Abundant evidence for a long interval of non-glaciation may accumulate.

Readvancing ice can play havoc with all of this evidence by its erosion and transportation of material in its path. Evidently this is what happened, at least locally in Illinois, towards the close of the Aftonian, because no buried soils nor animal remains have been found with the till in Fulton and Scott Counties. Not even outwash is associated with the Scott County occurrence, but in Fulton County, a sand, which may be wash material of Aftonian age, is a local deposit in the drift. The Nebraskan till in the Fulton County drift shows a disturbed position in the Kansan till surrounding it as if it had been exposed to the pressure and shove of the later advancing ice.

⁴Wanless, H. R., Nebraskan till in Fulton County, Illinois. Ill. St. Acad. Sci. Trans., vol. 21, 1929, p. 273-282.

⁵Bell, A. H. and Leighton, M. M., Nebraskan, Kansan, and Illinoian tills near Winchester, Illinois Bull. Geol. Soc. Amer., vol. 40, 1929, p. 481-490.

However, in Iowa, not far to the west, an entirely different picture of the life remains may be obtained. The term, Aftonian, comes from Afton Junction, Iowa, where it is now somewhat doubtful whether actual deposits of this age occur. The deep layer of gumbotil offers evidence, however, that long interglacial time occurred.

The fauna remained nearly as complete as it was before glaciation set in. There was real profusion of vertebrate life. There were two genera of giant ground sloths, six species of elephants, camels, horses, bison, deer and beaver. Some of the organisms clearly were adapted to Arctic conditions, settling their abode, evidently, not far from the ice front wherever it existed. A large list of molluscan forms, small clams and snails, is checked off from the fresh water and land. In the list are three species found also in the Kansan associations (Yarmouth) of Macoupin County, Illinois. Most of the invertebrates, as Coleman⁶ points out, still survive, but the great majority of the mammals have become extinct.

Climatic conditions for plant growth evidently were good. The climate, although probably more moist, may have been as mild as at present. Forests grew first where now there are prairies. The peat bog pollens indicate that at first the forests were coniferous. Then, the prairies succeeded the "pines" and held sway for a long time. Oaks invaded the prairies in part and then gave way once more to the conifers. The latter held place until the ice came again.

THE KANSAN GLACIAL STAGE

Till, older than the Illinoian, is now found in so many places along the southern margin of the drift-sheets that the sources of the ice for this invasion are thought by glacialists to have been in two centers. One, called the Keewatin center, was located west of the northern part of Hudson Bay. The other region, approximately 1,200 miles farther east and south, was in the region of the Labrador Peninsula. Recognizing the Kansan readily as one of the earlier drifts, students at first seemed inclined to think that the ice came from the Keewatin center. But, in 1933, MacClintock⁷ assigned the pre-Illinoian drift to the ice which came from the Labrador center. Later, in a posthumous volume of 1941, Coleman made the same statement.⁸

The recent most extensive surveys of the pre-Illinoian till, known to the writer, have been made by MacClintock. Mapped exposures stretch in a belt across the state from Greene County to Clark County. This belt is not far north of the 38th parallel, and, in its eastern extension, is not far south of the southern boundary of the Wisconsin drift,

⁶Coleman, A. P., *The Last Million Years*. The University of Toronto Press, 1941, Toronto, Canada.

⁷MacClintock, Paul, Correlation of the Pre-Illinoian drifts of Illinois. *Jour. Geol.* vol. 41, 1933, p. 710-722.

⁸*Op. cit.*, p. 57.

the Shelbyville moraine (Fig. 1). More than thirty exposures, including one far to the south, have been described by MacClintock. In them an average thickness of slightly more than twenty feet is in sight. In one or two instances buried soil is preserved, but in most cases erosion by the Illinoian ice evidently has removed in part the soil profiles developed on the Kansan till during the Yarmouth interglacial stage. Some of the Kansan and Yarmouth deposits are deformed and crumpled as if subjected to the movement and pressure of the over-riding ice. Gumbotil, locally, has been developed up to a thickness of six feet, and maximum instances of the downward effects of oxidation of eighteen feet are noted. The till has been leached of its calcareous contents in one or more instances down to depths of eight feet.

The writer has had the opportunity to examine some of the pre-Illinoian glacial and interglacial deposits in Macoupin County, especially in the vicinity of Carlinville, Illinois. He has had the privilege of field conferences with Drs. M. M. Leighton, G. E. Ekblaw, and Paul MacClintock, all of the Illinois State Geological Survey during many of the inspection visits. The Kansan till, where seen, rests on the limestone of the bedrock in three instances. The base of the till thought to be Kansan till has not been seen in other exposures. The till is much thinner than elsewhere in the State, and a maximum thickness of eleven feet is all that is known in this vicinity. Dr. Lee⁹ has observed a possible thickness of thirty feet of Kansan till, but elsewhere in this same vicinity the till is considerably less in exposed thicknesses. The slight thicknesses of Kansan till near and in Carlinville are gray to chocolate brown in color, hard, compact, quite free from pebbles, and are both leached and calcareous.

About nine miles northwest of Carlinville, some glacial striae once were observed not on the bedrock surface but on the till. The striae were exposed on a shallow and relatively broad valley floor, adjacent to a small stream, east of the road to Palmyra and about 200 yards north of the Duncan school. They were discovered there by Dr. C. E. Needham in the autumn of 1929. This part of the stream valley has since been used for a reservoir and it is possible that the striae have been obliterated. The till bearing the striae is a hard, bluish-gray, non-calcareous deposit quite free from pebbles. The striae indicated that the glacier moved from the northeast. The striated till may be the Kansan, marked by the advancing Illinoian ice, or it may be an earlier Illinoian till marked subsequently by a readvance of that same ice-sheet. The evidence is not conclusive, either way.

Ice advances commonly are so destructive that little remains but extensive till deposits to mark the Kansan advance in Illinois. Lee re-

⁹Lee, Wallace, Gillespie-Mount Olive folio, Geologic Atlas of the United States, U. S. Geol. Surv., no. 220, 1926, p. 6.

ports a good deal of coal and shale in Macoupin County, possibly scraped from the coal-bearing bedrock beneath. Elsewhere than in Illinois, large trees are embedded in the Kansan till suggestive of the forests overwhelmed by the ice as it advanced. Probably at this time, the diversion of the Missouri River from a far-distant point in northwest North Dakota to its junction with the Mississippi was the most spectacular event during the Kansan advance. Formerly, that stream had been flowing northeasterly to Hudson Bay, but the Kansan ice blocked its valley. The Missouri River was forced to cut across country to the Yellowstone River valley and then the waters of the combined streams were deflected far to the southeast coming to the very margin of Illinois to join with the Mississippi.¹⁰

THE YARMOUTH INTERGLACIAL STAGE

Illuminating evidence for a long period of ice retreat following the Kansan invasion again comes from Iowa. The Yarmouth Inter-glacial Stage takes its name from Yarmouth, a village in southeastern Iowa, not more than 100 miles from Fulton County, Illinois, where Wanless found the ancient tills. In a well of that settlement, about 1889, Leverett¹¹ found a peat deposit containing twigs and bones of small mammals. From the thickness of the peat and the clay underlying it, but more particularly from the depth of weathering in the top of the Kansan till, Leverett was convinced that much time elapsed following the withdrawal of the Kansan ice.

The Yarmouth peat contained the fossil bones of extinct species of a rabbit and a skunk. Similar deposits in neighboring states have yielded many other species. It is not always convincing, however, whether the fossils belong properly to the Yarmouth or to later times. But the total yield is impressive containing evidence of fourteen extinct species including the giant sloth, peccaries, tapirs, elephants, horses, deer, bison, wolves, and giant beavers. These are in addition to the rabbit and skunk previously mentioned. This assemblage points to variable climates, one permitting the peccaries and tapirs to be present, and then a cooler stage when the others were representative forms. The forest growth for the latter type included the pine, tamarack and juniper. The bison and horses suggest the existence of prairies, and the ground sloths and giant beavers may have demanded the deciduous forest.

The Yarmouth deposits near Carlinville, Illinois, are the same in general character as those known elsewhere and described by Wanless, MacClintock and Lee. Commonly the deposits are not more than six

¹⁰Alden, W. C., Physiography and glacial geology of eastern Montana and adjacent areas. U. S. Geol. Surv. Prof. Paper 174, p. vii and 58, 1932.

¹¹Leverett, Frank, The Illinois Glacial Lobe. U. S. Geol. Surv. Mon. vol. 38, 1899, p. 42-43

feet in thickness although one near Hillsboro is about thirteen feet. A peat near Nilwood in Macoupin County is known to be about seven feet thick, but in other water-laid deposits in the vicinity the thickness is about one-half that, and several humus bands are only a few inches thick. The Kansan till in and east of Carlinville is rather deeply leached, but farther north where peat and humus occur the till is calcareous. Before the Illinoian ice the land evidently was low-lying and covered in part with flood-plains and swamps. Wells and mine shafts have furnished evidence that possibly there are several fairly broad pre-Illinoian valleys now filled with till and alluvial deposits. The rather marly humus bands and peat deposits are the organic accumulations on the flood-plains and in the ponds of the lowlands surface.

The rather diminutive fossils of the Yarmouth deposits are chiefly those of gastropod molluscs. Only one genus of a small fresh-water clam has been obtained from a total of nine collections. There are six species from the Nilwood humus and silt deposits, from three to three and one-half miles west of that village, which are reported also in the Fulton County Yarmouth. Two of the same species are found in Clark County on the eastern edge of the state and one occurs also in the Hillsboro Yarmouth not far from Nilwood. The humus band and silt deposits contain thirty-six species of gastropods, some of them land forms, so that a further comparison than is here made probably would bring out a more extensive correlation. F. C. Baker examined the collections in 1930 and found a sufficient fauna to enable him to pronounce eight of the nine collections, based on the occurrence of twenty-eight species, as of Yarmouth age.¹³

Dr. John Voss of Manual High School, Peoria, recently has examined the Nilwood peat and finds that the forest growth was essentially that of the northern coniferous and that firs and pines were in the greatest abundance. His determinations were made by pollen analyses¹⁴ and show that the Nilwood bog shows the same forest conditions as those which prevailed at Quincy, about 100 miles west and north of the Nilwood region. These data coincide very well with the general evidence for the rainy, cool, temperate climate then indicative, possibly, of the renewal of glacial conditions.

THE ILLINOIAN GLACIAL STAGE

The areal extent of the Illinoian drift-sheet in the Mississippi Valley shows that the ice of this invasion penetrated farther south than in previous stages. It crossed into Kentucky, and its deposits are found also in Iowa, Missouri, Indiana and Ohio. Figure 1 shows that Illi-

¹³F. C. Baker, personal communication, 1930.

¹⁴Voss, John, *Forests of the Yarmouth and Sangamon interglacial periods in Illinois*, Ecology, vol. 20, p. 518-523, 1939.

noian drift occupies approximately two-thirds of the state. The greatest extent of the till lies in this state, hence the name of the state is given to the entire drift-sheet.

The till shows a buff to brown color where oxidized, but its basal portions are a light grayish-blue. The material is hard and compact and the resistance it offers to road-graders and well-drillers merits the name of "hard-pan" in many of its phases. Its thickness is quite variable, due in part to the relief of the older drifts and bedrock which it has covered. Many observed thicknesses in Macoupin County are approximately twenty feet, in exposures where its entire reach from the loess covering it down to the Yarmouth is in view. But an early geological report for the state shows that in a well started from a valley flat, three miles south of Carlinville, the till was penetrated for 160 feet.¹⁵ This well location evidently happened to be above an ancient valley cut deeply into the older till and bedrock. Some of the greater thickness for the Illinoian till stated in various reports probably includes the older drifts as well.

The most impressive feature, probably, of the Illinoian drift-sheet is the vast flatness of its upland "prairie" surface. A part of the level aspect is due to the general covering of loess which covers the till, not in a great thickness in the interior of the state, but quite uniformly. A marked peculiarity of the upland is in the plentiful distribution of elongate hills (Fig. 1) which surmount the till plain. Many of the hills are quite isolated, but others are associated either with similar elevations, or, with hills which seem to be morainic in origin. Figure 1 shows nearly sixty hills of this type, all greatly exaggerated in scale, whose locations are known chiefly because they make prominent features on the various topographic maps.

Nearly one-third of the number of hills plotted on the map have been visited in the field by the writer and something is known of their composition. As far as observed, they are capped by variable thicknesses of loess, some have a considerable amount of till, but in several known instances the loess rests directly on gravel and sand. On account of the straightness of their margins, the gravel core often present, and the more or less linear distribution which a number of them may possess, it has been suggested that some of them may be crevasse fillings.¹⁶ This means that in a more or less stagnant and melting condition of the ice, crevasses gaping open to the surface were partly filled by the in-wash of running water bringing sand and gravel to the trough-like opening in the ice. While this explanation may apply to some of the elevations, it probably does not account for all of them; neither does the entire number appear on the map (Fig. 1).

¹⁵Worthen, A. H., *Geology and Paleontology of Illinois*. Geol. Surv. Illinois, vol. 5, 1873, p. 287.

¹⁶Ball, J. R., *Elongate Drift Hills of Southern Illinois*. Bull. Geol. Soc. Amer., vol. 51, 1940, p. 951-970.

The Mississippi River, prior to Illinoian glacial times, had been flowing from near Fulton, Illinois, southeastward through Whiteside and Bureau Counties and then more directly south along the present course of the Illinois below "the big bend." The Illinoian ice coming from the northeast blocked that flow and forced the river westward to about its present vicinity where it suffered further modifications, some of them possibly coming as late as the Wisconsin stage of glaciation.^{17, 18}

THE SANGAMON INTERGLACIAL STAGE

Another assortment of glacial features takes its name from an Illinois locality because of characteristic development there. These are the soil and loess of the Sangamon interglacial stage. The deposits of this stage also are widely distributed in the state; those forming the bases for comments in this and the following paragraph range from twenty miles south of Springfield to fifty miles northwest of it, to Mahomet in Champaign County, seventy miles northeast. The deposits were first noted and named in the drainage basin of the Sangamon River, which runs north from Springfield for twenty-five miles and then turns abruptly west to join the Illinois. The duration of the Sangamon stage, although very long, seems much less than that of the preceding interglacial stages. Vertebrate remains are reported in some abundance from regions within the state including the elephant, mammoth and mastodon, elk, bison, horse, and deer. Absolute certainty concerning the age of deposits containing some of the remains does not always obtain, however.

Invertebrate remains include molluscan land and fresh-water life in great abundance, and a new element is introduced in an abundance of beetle carapaces found near Mahomet, Illinois, by Dr. T. E. Savage of the University of Illinois. The presence of the beetles has led to the suggestion that the Sangamon climate was more rigorous than at present known in southern Illinois. In the north-central part of the state, fragments of the birch, spruce and tamarack have been obtained. Voss found that near Canton the forest again was coniferous—fir, spruce, and pine dominant—but hemlock appeared in somewhat greater quantity than in the Nilwood vicinity, 200,000 years earlier. There also is some indication either of an oak tree encroachment or the pollens were blown in from far distant.¹⁹

THE WISCONSIN GLACIAL STAGE

The last stage of continental ice invasion probably began in North America over 100,000 years ago. It is not known how far the Illinoian

¹⁷Leighton, M. M. and Ekblaw, G. E., Guide Book, Ninth Ann. Field Conf. Kansas Geol. Soc., Log for the first day, 1935, p. 44.

¹⁸Leverett, Frank, Shiftings of the Mississippi River in relation to glaciation. Bull. Geol. Soc. Amer., vol. 53, 1942, p. 1283-1298.

¹⁹Voss, John, *op. cit.*, p. 525.

ice had retreated during the Sangamon Interglacial stage, or whether it had wholly disappeared. Its readvance must have been exceedingly slow, but the culmination of its approach may have been reached at least 80,000 years ago.²⁰ Prior to this climax the Mississippi River



Fig. 2. Kamic hills in a part of the Kettle Moraine near Oconomowoc, Wisconsin.



Fig. 3. Esker extending from the front of the Valparaiso Moraine, near Cary, Illinois.

had been cutting its channel through its lower rapids above Keokuk, Iowa, and, in this general vicinity, the Illinoian drift was free from its later covering of loess long enough for a moderate depth of gum botil to develop.

²⁰Leverett, Frank, *op. cit.*, p. 1287.

The culmination of the Wisconsin Stage is vividly shown in the huge Bloomington-Shelbyville moraine which encloses the northeast third of the state. These ridges of thickened drift practically mark the boundary of the Wisconsin drift (Fig. 1), although in the western and northwestern parts of the state, early Wisconsin tongues of ice extended farther west past Princeton and Belvidere. Between the Shelbyville-Bloomington moraines and between the Bloomington moraine and Lake Michigan are other semiconcentric ridges. Throughout this morainic maze are scattered the evidences for former ice-sheet occupation. Kamic hills both incorporated in the marginal moraines (Fig. 2) and separate from them make the sky-line. Strongly elevated and lengthy till and gravel ridges, the eskers (Fig. 3) stretch in directions transverse to the trend of the knob and kettle moraines.

The position of each moraine is significant because each marginal moraine marks a long pause in the general movements of the ice-sheet. The melting marginal ice dropped its load, but the steady advance of ice throughout the mass constantly brought a new supply of debris to the place of marginal release. And so, the shifting ice clearly mapped its own positions in each deliberate stand of its ebb and flow.

The contrast between the strongly ridged drift of the Wisconsin stage and the flattened prairies of the older drift is impressive. It emphasizes the great discrepancy in age between the two drifts, and perhaps it also hints of a different mode of dissipation of the older (Illinoian) ice-sheet. As far as the hoary marks of age on the Wisconsin drift are concerned, they are significant largely for their insignificance. Only a total of two or three feet of leaching marks the few-score thousands of years since the Wisconsin drift was uncovered.

Another function marked the latter of the Wisconsin moraines to be formed, those which extend farther south and east than the present Indiana shore of Lake Michigan. Some of these exercised control for the ponded melt waters of the waning Lake Michigan lobe of the ice. But before that control could become established, apparently, a short-lived but dramatic picture of that melt water flashes into the closing chapters. A gigantic but totally vanished river, almost a lake in itself, made history for a while. The Glacial Kankakee Torrent it is called by the geologists who restudied the evidence it left behind.²¹ The waters for the torrent were supplied by the melting ice at about the time that the Valparaiso Moraine, the great moraine only twenty miles west of the Chicago Loop, was being formed. The torrential waters, moving as a lacustral flood along the front of the Valparaiso Moraine, escaped to the southwest along the general course of the Illinois River. These waters later were followed by the outlet discharge of Lake Chi-

²¹Eklaw, G. E., and Athy, L. F., Glacial Kankakee Torrent in northeastern Illinois. Bull. Geol. Soc. Amer., vol. 36, p. 417-428, 1925.

cago which was formed north of the Valparaiso Moraine as the ice melted back.

A short time before all this, west of the Valparaiso Moraine and possibly to the north of the Glacial Kankakee the animals of pre-history whose ramblings have been noted in this paper, assembled probably for the last time. Their grazing fields were plentifully watered by streams flowing southward parallel to the present Fox River of Illinois. Vegetation must have been plentiful because the mammals were numerous. And still holding place among them were the mastodon, the giant beaver, deer, elk and bear. Both near Minooka and Aurora the bones of these animals, along with a numerous molluscan fauna, have been excavated as recently as 1934. And so, for the entire Ice Age some of this vanished assemblage were inhabitants of Illinois. And along with them now appear the bones of lesser animals like the trumpeter swan and the muskrat.

To trace farther the paths by which the ice cap retreated northward would lead one out of the state and along the shores of Lake Michigan where several moraines, later than the Valparaiso, swung across the Lake. And with this further trek would come the investigation of the Glacial Great Lakes which in their involved history indicate the final abandonment of the continent by the ice cap. But, Illinois is now free from the ice of the Great Ice Age! This is not the end of the story, but the further story is not the task of this paper.

Test Your Nature Lore

True or False?

1. The Pleistocene period of geologic time, known as the "Great Ice Age," was the most extensive period of glaciation the world has known.
2. All large ice masses resting on land are known as *glaciers*.
3. The direction in which a glacier is advancing is known as its *drift*.
4. Ice deposits its load in layers of fragments, graded according to size and weight.
5. *Eskers* mark the beds of streams which once flowed on or under glacial ice.
6. Male game birds of northern regions occasionally develop modifications known as *faceted spurs*, which are an adaptation for locomotion on ice.
7. Mushrooms growing near ice margins frequently develop supplementary basal growths, called *lateral moraines*.
8. *Loess* is loosely consolidated glacial till.
9. A *peneplain* is a surface scraped level by glacial action.
10. There are no longer any continental ice sheets on this planet.

Answers on Page 85.

Museum Activities

Winter Lectures

The annual winter series of Sunday afternoon lectures begins January 10 and continues through February 28, 1943. These lectures, as usual, are free to the public, but in order to eliminate confusion and give members of the Academy the benefit of seats reserved in advance, tickets for admission to the lecture hall will continue to be used.

Members of the Academy may reserve tickets either by writing the Academy or telephoning LINcoln 0606 up to noon on the Saturday preceding the lecture, and their tickets will be held for them at the museum office until 3 o'clock, when the lecture begins. All seats in the reserved section not claimed by 3:00 P. M. will be made available to the general public.

General admission tickets will be available only on the day of the lecture, from 1:00 to 3:00 P. M. at the Museum.

The doors of the Auditorium are opened at 2:30 P. M. and closed at 3:00.

Jan. 10: **Scrap Book of the West**, Sam Campbell, "The Philosopher of the Forest," through the courtesy of the North Western Railway Company.

Jan. 17: **The Desert Lives**, John Y. Beaty, Author, Naturalist—Chicago.

Jan. 24: **Nature's Western Playgrounds**, Ted Phillips, Naturalist, Photographer—Chicago.

Jan. 31: **America's Heritage — A Symphony in Color**, Dr. Louis J. Tint, Chicago.

Feb. 7: **The Solar System**, Dr. Oliver Justin Lee, Director of Dearborn Observatory, Northwestern University.

Feb. 14: **Mexico Today**, Henriette Mertz, Chicago.

Feb. 21: **Trees and Plant Life of Oregon**, Dr. Charles A. Shull, Professor of Botany, University of Chicago.

Feb. 28: **Modern Aspects of Tropical Biology**, Dr. Orlando Park, Associate Professor of Zoology, Northwestern University.

Honorary and Life Members

At recent meetings of the Board of Scientific Governors and Trustees, Dr. J. T. Stark, professor of geology, Northwestern University, was elected an honorary member of the Academy; Dr. John R. Ball, E. R. Ford, and Dr. V. O. Graham were elected to life membership.

A Visitor from the Far North

A recent visitor to the Academy was Charles D. Brower of Barrow, Alaska, a settlement lying farther north than any other on the North American continent.

Mr. Brower, now in his 79th year, is a life member of the Academy. Through his activities our ornithological collection has been greatly enriched with Alaskan material.

Until his departure from the north in September, he was chairman of Draft Board District No. 21, a territory of about 55,000 square miles—the largest geographically in the United States. Of a population of 1,100, he reports, eleven men have volunteered their services to the armed forces.

Our visitor is a co-author of a recently published book, "Fifty Years Below Zero," which relates to his experiences of more than half a century on the shore of the Arctic.

Staff Notes

Kathryn J. Stephenson recently joined the museum staff as librarian. She is a graduate of the University of Illinois, where she specialized in chemistry and biology and received her library training, and of the University of Maryland, where she received the master's degree in botany.

Edward R. Ford, for many years honorary curator of ornithology and well known to members and friends of the Academy, has been added to the museum staff for the winter months of 1942-3 as acting curator of birds and mammals.

Harriet M. Smith has recently been appointed assistant to the director of the museum and will begin her duties on January 1. She will have charge of educational activities and public relations work for the Academy.

Miss Smith was graduated from Northwestern University in 1932 with majors in geology and zoology, and received the master's degree in anthropology from the

University of Chicago in 1936. From 1938 until the outbreak of the war she served as state supervisor of the extension program for the Illinois State Museum in Springfield, with particular responsibility for the development of educational and archaeological activities over the state.

New Scientific Publications

The following technical papers have recently appeared in the *Bulletin of the Chicago Academy of Sciences*: "The Rediscovery of *Anoplodusa arizonensis* (Orthoptera)," by E. R. Tinkham; "Amphibians and Reptiles from the Carmen mountains, Coahuila," by H. K. Gloyd and Hobart M. Smith; "The Ring-neck Snakes, Genus *Diadophis*," by Frank N. Blanchard. The last is an important systematic monograph of 144 pages, 26 figures, price \$1.25.

Active members of the Academy may obtain these papers without charge upon request.

Test Your Nature Lore

Answers to questions on page 83.

1. False. While the Pleistocene is referred to as the "Great Ice Age," its glaciation was far less extensive than that of the earlier Permian period, whose ice sheets were literally world-wide.
2. False. To be a true glacier, the mass of ice must be moving slowly over a land surface.
3. False. All glacial deposits are referred to collectively as "drift."
4. False. "The most outstanding feature of ice deposits is that they are unsorted." (Croneis and Krumbein, *Down to Earth*)
5. True. Eskers are composed of sand and gravel deposited in the same manner as in our present stream beds.
6. False. The tip of a spur of rock extending into a valley through which a glacier is moving (or down which strong winds from a glacier are blowing) will be sheared or abraded to form a face paralleling the direction of glacial (or wind) movement.
7. False. A lateral moraine is a belt of drift released at the sides of an ice sheet.
8. False. Loess is soil material which has been carried by the strong winds blowing from an area under glaciation.
9. False. A peneplain is the final stage in the erosion cycle—the lowest level to which streams can reduce a land area if they are given unlimited time in which to work.
10. False. There are still two great ice caps—over Greenland and Antarctica. Whether they are growing or dwindling has not been determined.

If your score on this test is low, read Dr. Ball's article, page 67 ff., in this issue of *The Chicago Naturalist*.

The Naturalist's Book Shelf

THE AMATEUR SCIENTIST

By Stephen Thomas

W. W. Norton and Company, Inc.
New York, 1942, 291 pages. \$3.00.

The Amateur Scientist was not written for, but about, the 150,000 or more individuals in the United States whose interest and activity in science is avocational and recreational rather than professional. The book is an informal monograph covering a study of 727 amateur scientists in the Philadelphia area—an undertaking of the American Philosophical Society's Committee on Education and Participation in Science, of which the author, W. Stephen Thomas, is Executive Secretary. While the phraseology and treatment of the data are those of the sociologist or educational psychologist, the necessary statistics are presented in readable narrative form.

Over a fourth of the publication is devoted to the description of four sample scientific research projects conducted between 1939 and 1942 by amateurs under the leadership of a specialist in the field for each program. The research project in tree-ring chronology was particularly significant, in my opinion, in that the wide appeal of the subject drew into a coordinated program amateurs whose primary interests ranged from botany and climatology to local history and documentary research, and even photography.

Both Mr. Thomas and Dr. Edwin Grant Conklin, who wrote the Foreword, emphasize the importance of developing "scientific-mindedness" in the citizen, not only for maximum effectiveness of the war effort but for the peace-time living and scientific progress of the future. According to Mr. Thomas, "not only will science continue to improve and simplify our ways of living, but science as a method of thought and action will be brought

closer to the man in the street. . . . Changes in the national economic structure have already resulted in a decrease in private support for scientific investigation, so that the public as a whole will be obliged to contribute financially to scientific progress."

This study of the forgotten, or at least rather generally overlooked, man in science should furnish valuable suggestions and thought-provoking possibilities to the officers of scientific institutions interested in giving greater service to their communities through sponsorship of similar programs, to officers of science clubs with organizational, membership, or program problems, to scientific laymen, interested in organizing a club group or in selecting projects for individual research, and to adult educators and teachers working with science project groups in the schools.

Harriet M. Smith

BIRDS ACROSS THE SKY

By Florence Page Jaques

Harper & Bros., New York, 1942. 240 pages.
Many illustrations by Francis B. Jaques.

When a woman marries a bird man she lets herself in for a variety of experiences—some grave, some gay, some dull, according to her adaptability. The author of *Birds Across the Sky* proves herself adaptable and, as already she was versatile, she used the material of her experiences in a book of considerable charm. She takes the reader with her and her museum-artist husband to far places to study the activities of birds and the backgrounds of birds.

The reviewer enjoyed especially her descriptions of the flights of wild fowl.

The book is as much concerned with persons, "bird persons" for the most part, as with birds. Apparently the author likes people and is in turn liked

by them. She expresses this when she tells of her meetings with famous ornithologists.

Her most enthusiastic readers will be, one feels sure, other women who have married bird men. There are familiar domestic touches. Once the author indicates her husband's non-conformity by citing his refusal to eat an ear of corn with straight rows. He liked them crooked so he would not have to follow them.

It would not be true to say that artist Jaques' pictures make the book but certainly such illustrations as "lapwings in an English sky" and other decorative pages make it physically an attractive volume.

Only occasionally does one of the author's statements constrain the lifted eyebrow. Once she speaks of an ornithologist who was said to be able to identify in the field "all known subspecies at ultimate range." Again she describes a prothonotary as "an inch long." Intentional hyperbole in both cases, no doubt, but misleading to the layman.

It is a readable book, with Mrs. Jaques' familiar and delightful verses about the puffin added for good measure.

E. R. Ford

BIRDS OF NORTH CAROLINA

By T. Gilbert Pearson, C. S. Brimley, and H. H. Brimley

North Carolina Department of Agriculture,
State Museum Division, Raleigh, 1942, 416 pages,
37 plates, 141 figures. \$3.50.

Though less pretentious than some of the more recent state "bird books," this volume will prove most satisfying to observers and students of the avifauna of the region treated.

Three hundred and ninety-six forms are named and described and, for each, the general range and the range in North Carolina are given. Then follows text, averaging somewhat less than a page for each form, which is devoted in some cases—that of the myrtle warbler for example—to migration dates, plumage changes and

food. In other cases—that of the ruby-crowned kinglet as an instance—the authors' concern is with migration dates, identifying characters and song. Obviously in a work of limited size to cover completely migration, voice, food, nesting and other relevant matters, would be impossible.

The descriptions are non-technical but, taken together with the figures in the text (some the work of Peterson and others of Brasher) and the plates (20 are from Peterson's guide), they should prove adequate for the identification of all full species listed. There are also full page color plates by Brasher and by Horsfall for further illustration and aid.

One would have preferred that in the treatment of "Range in North Carolina," greater consistency had been employed. The range of the greater yellow-legs is given as "coastal regions and sometimes seen inland," while the range of the lesser yellow-legs is described "coastal regions during migrations and many also found inland." It would have been better to specify "during migrations" in both cases. Of Cory's shearwater it is said "may be found at any time," but "along the coast" is omitted, whereas, generally, the authors include it in referring to oceanic birds.

There is as part of the introduction an interesting "Ornithological Historical Sketch"; also a complete bibliography. This reviewer is glad to note that a few brief paragraphs, conspicuously placed, call the reader's attention to bird banding—a subject about which every bird observer should be informed.

If one considers how much time and effort, not only in the field studies of the naturalist-authors but in the preparation of the book, have been devoted to "Birds of North Carolina," and views the physical excellence of the volume, it seems simple good fortune to be able to obtain it for the small sum at which it may be had.

E. R. Ford

WAYS OF THE WEATHER

By W. J. Humphreys

Jaques Cattell Press, Lancaster, 1942, 400 pages. \$4.00.

Early in its history the U. S. Weather Bureau recognized that the all important problem of weather prediction could be solved only by men who understand the general principles that control our weather. It is for this reason that the government has selected such men as William Ferrel, Cleveland Abbe and W. J. Humphreys—all intimately acquainted with the science of physics—to act as advisors of the Bureau.

As a young man, Dr. Humphreys made himself well-known by his contributions to physics and astronomy. It is now approximately a quarter of a century since his excellent treatise on the *Physics of the Air* first made its appearance. It is a volume which was, at once, recognized as clear and authoritative. Now comes his new book *Ways of the Weather* which thoroughly justifies its subtitle—a “cultural survey of meteorology.” His English style is clear and simple—admirably adapted to students of nature who love to tramp in the open air, observe the sky, and guess at tomorrow’s weather. The whole treatment is lightened by fine bits of humor and copious illustrations.

The sixteen chapters which constitute the volume, are indeed sixteen highly interesting essays, each dealing with a different phase of the weather. The reader is sure to be delighted with the chapter on the composition of the atmosphere and also with that on the distribution of temperature over the globe and throughout the year. Your reviewer is especially impressed by the excellence of the chapter on atmospheric electricity. No reader can fail to be grateful to Dr. Humphreys for being personally conducted through the maze of meteorology without striking any snags, such as differential equations.

Henry Crew

PLANTS IN THE HOME

By Frank K. Balthis

The Macmillan Company, New York, 1942, 172 pages, illustrated by Tabea Hofmann. \$2.50.

The experience and knowledge of a horticulturist of the Garfield Park Conservatory, Chicago Park District, were necessary to bring together all the useful information contained in this book. The surroundings for the plant, what fertilizers to use and how to use them, the kinds of plant containers with a discussion of the drainage permitted by them, make up information concerning the physical needs and surroundings of plants. The care of plants including watering and washing them, control of insects and diseases which will prevent their proper growth, the uses of plants about homes, how they may be chosen, arranged and cared for with the many points of information required for each procedure are included.

Every home-owner or apartment-dweller will find in this book the necessary information for successful growing of plants in the home. He will find the materials contained in these pages of certain value because they are based on years of successful experience in growing plants in the Garfield Park Conservatory.

Verne O. Graham

Accurate

That this world in which we live and take as a matter of course, is, in the eyes of pre-school youngsters, a great and wondrous and mysterious place, undoubtedly is substantiated by the reaction of 4-year-old Kathryn when she first saw a snake.

Kathryn ran shouting excitedly from the garden into her home:

“I saw something! I saw something!” she cried.

“It was all tail except the head—and the poor thing couldn’t even stand up!”

Taken by P. B. from the Seattle Times. Reprinted, with permission, from Journ. Amer. Med. Assn., Dec. 26, 1942.

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